

20 SEPTEMBER 1974
CLASSIFIED ADS-

FOR SALE: 28ASR, CAN SHIP in factory carton, \$750. Two 28KSR, local only, \$250. 5 Kw 110 volt, 60 Hz water cooled power plant with remote start, etc. Local only, \$450. CE600L, can ship, \$175. National WRR/2 frequency synthesized receiver (500 Hz incremental tuning model-latest version) complete with manual and torpedo proof mounting crate. Local pick up only, \$750. Tekronix 310A (4MHz) scope, excellent condition, \$275. Will trade the WRR/2 receiver for a late model 51S1. Hank Scharfe, W6SKC, P O Box 338, South Pasadena, Calif. 91030 (213-682-3705 or 799-5886).

METRIC SYSTEM EXPLAINED, 500 Physical Measurements Converted. Booklet \$2.00 H. Morgan, 883 Diana Akron, Ohio 44307.

FOR SALE: MODEL 28ASR Mark 3 with keyboard, reperf, and LXD. Excellent condition. \$950.00. David Balco, 3005 Concord, Trenton, MI. 48183. (313) 676-6856.

SPECIAL SALE-AUTOSTART until end of Sept. 1974, \$15.00 ppd. PC boards \$2.00 ea. and complete modules \$15.00 ea. ppd. Great for Mars nets etc. Turns machine on after 2 seconds steady mark, 2125 tone. Send SASE for catalogue. P.C. Electronics, W60RG, 2522 S. Paxson Lane, Arcadia, CA. 91006.

WANTED: VOLUNTEER IN ORANGE, CALIFORNIA area to handle traffic for Bible translators. Also need RTTY gear; tax deductible. Write Mike, WA8-BHR, 4466 Burich Road, North Street, MI 48049.

CHEAP - EASY RE-INKER

While visiting Paul W8IDJ in Detroit, I was shown a very simple, unique re-inker. The idea came from Doug Freede (a name in the Detroit area that means Mr. Teletype).

The materials needed are an empty ribbon spool and a pair of tin snips.

With the tin snips, remove the top flange of the spool up to the large center shell.

Install the modified spool, either on the left or on the right hand side, of your machine. The unmodified flange is placed on the bottom.

When the ribbon needs reinking, let the ribbon wind up and fill the modified spool. Use a tube of NCR K-575 black transverse printer ink. This may be obtained at any National Cash Register office (check your yellow pages for the local office). Spread the ink liberally on the top of the entire ribbon.

That's it, the ink will soak evenly throughout the entire ribbon. Buy one good nylon ribbon and use it for years.

TRY IT, YOU'LL LIKE IT!

Truman Boerkoel K8JUG

2666 Edwin Drive Xenia, Ohio 45385

FIRST CLASS MAIL



Address Correction Requested
RTTY JOURNAL
P O Box 837
Royal Oak, Mich. 48068

RTTY JOURNAL

September 1974

EXCLUSIVELY AMATEUR RADIO TELETYPE

VOLUME 22 No. 7

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1st RTTY ART CONTEST

Something new has been added to increase interest in RTTY. Thanks to "Don", WA6PIR, ARTTY ArtContest has been planned - dates - rules, etc., follow below. Just about every ham with a printer has received pictures over the air at some time and now is your chance to be creative and make your own. Every one has a chance and as most of the

experienced fellows are judges and ineligible to compete the field is wide open. Only qualification is the transmission of the picture to another ham, any band is eligible so here is a chance for some of you two meter boys to show what you can do. If you have never made a RTTY picture, read Don's excellent article in this issue and start typing.

RULES FOR 1974 RTTY ART CONTEST

(1 September to 31 October)

1. All worldwide licensed radio amateurs and members of their immediate families (except as otherwise provided in these rules) are eligible to participate in this contest.
 2. Entries must have been originated by means of manual inputs to a teleprinter using a standard communications keyboard, and may be submitted only by the originator of the art, or by the amateur on behalf of a family member.
 3. Submitted art may be of any subject suitable for transmission via amateur radio.
 4. Entrants may submit as many entries as desired.
 5. Each entry shall be given a short title.
 6. Submitted art may contain overline shading.
 7. Tapes of entries shall be formatted to permit a reasonably short running time, and to be compatible with machines which do and do not downshift on space. Compatibility with machines which interchange the bell and apostrophe is not required. At least three functions must be used between each line, normally: CR LF LTRS.
 8. Each line of the art shall be limited to a maximum of 72 characters (including spaces) and tapes to a maximum running time of 40 minutes at 60 WPM for the art itself, exclusive of any other information on the tape.
 9. Each entry must have been transmitted for the first time via amateur radio after 1 September 1974, and must be accompanied by a confirmation of at least one receipt of its transmission, identifying the title of the art and the call letters of the receiving and transmitting stations. All confirmations must be in writing (not by RTTY transmission), and must have been obtained by the entrant from the receiving station. Entrants may obtain necessary transmission of their entry by any amateur radio station.
 10. The tape and prints of each entry shall carry the full name of the author, call letters of the submitting station, and mailing address. This information shall be both written upon a beginning leader of the tape and also punched in the tape to appear on page copy when reproduced.
 11. Entrants must submit one (1) five-level paper tape and five (5) prints of each entry and by such submission agree that the tapes and prints may be used, duplicated and published for any purpose.
 12. Tape, prints and transmission confirmation information should be securely packaged and sent to: RTTY Art Contest, c/o Don Royer, WA6PIR, 16387 Mandalay Drive, Encino, CA, USA 91316. Entries must be post marked prior to 31 October 1974. Entries will not be acknowledged nor returned. Winners will be announced as soon as possible after the closing date. (Since mail damaged tape will be of little value, it is suggested that tapes be wound tightly upon a hard core.)
 13. Entries will be judged on the originality of the author in selection of subject matter, on excellence of technique in producing the art and formatting the tape, on overall appearance of the art when viewed from a distance, on suitability for publication, and on the entrant's compliance with these rules.
 14. A committee of judges, made up from those individuals who have exhibited an interest in RTTY art, will select first, second, third and honorable mention winners. Winning entrants will receive a plaque for first place and certificates for other places. Winning entries will be published in the RTTY Journal and other amateur radio magazines. The decisions of the judges shall be final.
 15. Officials and judges of this contest and members of their families shall not be eligible to participate herein.
- Judges are - John, K2AGI, Neil, K9WRL, Lee, WA5EHA, Dick, WA7RQV and Don, WA6PIR.

Compatible CW Identification -

IRVIN M. HOFF, W6FFC
12130 Foothill Lane
Los ALTOS HILLS, CA. 94022

INTRODUCTION:

The FCC requires CW identification of all amateur RTTY stations. The rules have been modified through the years until now all you need to send is just your own call letters. This has made it possible to use mechanical or electronic devices that automatically generate the CW. Nearly all of these systems and techniques have had one thing in common -- they cause random garble to be printed on the teleprinter, since Baudot code and CW are not generally considered to be compatible. The following paragraphs shall describe an interesting technique that prints a most unusual and acceptable string of similar characters during the CW ident. If slowed sufficiently, it does not print anything on the page copy at all, even with perfect, full-shift CW!

VARIOUS SYSTEMS:

Through the years practically any system or technique that ever vaguely resembled CW has been tried by RTTY operators. Two fairly successful systems have been rather popular -- (1) Narrow shift CW and autostart and (2) automated code wheels or electronic message generators.

Other techniques have included straight hand key, special TD's rigged with polar relays and perhaps least suitable of all, pounding on the break key for full-shift CW. This latter technique normally produces the most garble of any of the systems, and cannot be controlled by autostart means.

Narrow shift ident became popular during the use of 850 shift. The entire CW ident could be kept within the relatively broad mark filter, thus no garble of any kind was printed. The boys who liked to send pictures became accustomed to sending legal identification without disrupting normal copy. Now that 170 shift is used on HF, it is difficult to properly identify while sending a long picture. Many stations have cranked their CW shift down to very narrow values, flaunting the FCC rule that a minimum of 100 Hz. be used.

The use of autostart techniques limits the reception of CW signals adequately for most purposes, but then the operator must wait a length of time before

resuming, to print normally once more.

MANUAL TECHNIQUE:

CW can be simulated with a system I believe was pioneered by Bob Weibrecht W6NRM. This involves the use of two fingers of the right hand alternated in a particular rhythm. The Blank key is used for the dashes and the letters key is used for the dots. Although transmitting Baudot characters, they are both non-printing and no garble appears on the page copy. This system at best is difficult to interpret as CW and does not adapt at all well to automatic methods.

AUTOMATIC MEANS:

Various mechanical devices have been used to send the CW ident. These include slowly-turning notched code wheels as well as modified TD's using polar relays and paper tape with characters arranged in a particular sequence.

Integrated circuits have made it possible to build excellent CW message generators at prices that make them quite appealing to RTTY operators. One of the best and most recent was designed by Howard Nurse W6LLO* and uses a pre-programmed 8223 PROM.

COMPATIBLE CW:

A system has been developed that is especially easy to use with the new electronic CW devices, since it only involves setting the clock speed to a particular value!

In the summer of 1972 I obtained a Datapoint 2200 computer. Part of the program I wrote for RTTY included a CW section. To use this most easily it was necessary to use full-shift ident. This normally is a "no-no" since it causes so much random garble. My identification was no exception! I began reviewing all types of systems that might allow full-shift and yet minimize the garble.

One day while talking with Bill Craig WB4FPK, I noticed an unusual amount of 'O' characters during his narrow shift ident. The computer printed nearly all O's while the 28ASR printed various characters including the O's. I asked Bill what he was using for CW speed and he remarked he was merely dividing his Sel-Cal clock by an additional four times. This had turned out to be the only CW speed he could readily obtain that sounded legal. He figured it was therefore 1/4th normal Baud rate, or about 13 wpm CW speed.

I began experimenting with the pro-

grammable speed of my CW ident and found I could print a Baudot 'O' character for each dot and two Baudot blanks for each dash. In addition, this gave over 70 points range on the printer! Whenever I sent my full-shift ident, it would print a string of 16 O's on the page copy and no other characters. To say I was delighted would be an understatement!

Paul Satterlee, Jr. WA5IAT and John Souvestre WA5NYY immediately became interested and proceeded to work out the math to see exactly what I was doing. About this time Karl Hatfield W6BXR thought the 13 wpm was too slow so he took his own CW device and started playing with the clock speed. He found a place (which we later calculated to be 16.6 wpm) where he was getting an 'M' for each dot and a blank plus an 'M' for each dash. This also gave nearly 70 points range on the teleprinter. We later calculated that at 8.7 wpm you would print nothing on the page copy at all, and Karl indeed verified this experimentally. In this case you print one blank for each dot, and three blanks for each dash. This system should be excellent for the picture boys. I am sure they would have no objections to the slow speed when they realize they can send legal CW ident and yet print no characters on the page copy!

EXACT SPEEDS:

There are three speeds at which compatible CW may be sent with teleprinters geared for 60 wpm (45.45 Baud). One prints O's, a second prints M's (or periods if in upper case) and the third prints only blanks, being of use primarily to those interested in sending lengthy pictures.

Char.	Hz.	CW WPM	Dot Length
O	10.9	13.1	91.6 ms.
M	13.8	16.6	72.4 ms.
(blanks)	7.28	8.7	137.0 ms.

SETTING THE SPEED:

It would be difficult to use a digital counter to set the speed, but certainly the counter would give a ball park figure from which you could then zero in on the correct speed. With no digital counter, just fiddle with the clock speed until you commence printing the characters you want while tripping off the CW ident and studying the results on the page printer.

ADVANTAGES OF COMPATIBLE CW IDENT:

Adapting the CW to a Baudot system has usually been a nuisance at best. Compatible CW allows full shift which is rather simple to implement. It prints a predictable string of known characters

and does not lock up the autostart. If using the periods like many of us you will find it sets the transmission off very nicely at the beginning and end. One fringe benefit has certainly been the desire on the part of most stations to now send the ident at the beginning of the message as well as at the end. This has always been a legal requirement, but one that was often either forgotten or ignored. As this system uses perfect CW spacing, it is certainly readable by any standards of CW proficiency, and the moderate speeds are certainly well within the FCC requirements of under 20 wpm maximum.

REGENERATIVE REPEATERS:

If using a regenerative repeater utilizing one of the UART 40-pin chips, additional interesting benefits are possible. Since the UART starts looking for the next start pulse after the time has elapsed for the stop pulse to go by, the long dash characters will only print one blank and then the UART waits for the next transition from mark to space. If you have programmed the UART to require a stop pulse, then it kicks the character out completely on the long blanks. It was this type of device that is incorporated in the computer I have been using that initially led to our developing this system. If the clock is set for exactly 88 ms. pulses as was Bill Craig's, the computer, or other regenerative device of this type will ignore space pulses longer than that of a normal blank. As a result, although a normal printer would print the O's for the dots, it would often print some other character during the long blank for the dash.

THINGS TO REMEMBER:

When programming the CW generator, the dot is one unit. The dash is three units, with one unit between parts of the same character. There are three units between characters in the same word. Six unit between words is adequate. Mark frequency is key up, space frequency is key down.

Peter Morley K6SRG pointed out that a machine not equipped with spacing suppression on blank characters will walk across the page during the CW ident. Normally all machines have this feature but if not, it is usually a simple job to include it.

If using the slower speed to print blanks during a lengthy picture, it is possible for demodulators equipped with anti-space to still truncate the long dashes and print a garble character. You may want to disable the anti-space in this event.

THE CW GENERATOR:

After W6LLO's article appeared* enough inquiries about the availability of a PC board were received that he has now made one available. Postage-paid for \$5.50, he has included comments on how to add a variable resistor to set the speed to whatever you wish.

Howard Nurse W6LLO
665 Maybelle Ave.
Palo Alto, Ca. 94306

CONCLUSION:

An interesting type of "compatible CW" may be transmitted that produces a string of O's or M's (periods if preceded by a figures character) on the teleprinter. This merely involves adjusting the clock speed of the electronic CW ident generator properly. Full-shift for ident is then used by keying either

the loop directly or keying the base of the loop transistor on solid-state demodulators.

A number of people have been quite interested in this system and WB4FPK, WA5IAT, WA5NYY and W6BXR have been particularly helpful in developing the system to where it is almost enjoyable to send the CW ident now, and in fact most of us augment the message format with the string of characters produced. It sets the message or transmission off nicely while easily meeting the FCC requirements for compulsory identification!

*HAM RADIO, January 1974, feature article: "CW Memory for RTTY Identification", Howard L. Nurse, W6LLO, Page 6.

C.A.R.T.G. 14th Annual DX Sweepstakes.

With the SARTG DX contest starting the season about the time you read this the big daddy of all DX contests is planned for October 5-7. The C.A.R.T.G. is sponsoring the 14th annual DX Sweepstakes, this year honoring the "Winnipeg Centennial". Yearly this contest draws the largest number of entries and action. This year an important change has been

included in that all U.S. and Canadian call areas will count as separate countries in the scoring. This will give many stations chances for multipliers on the lower frequency bands and hopefully bring more action from a number of stations.

Read the rules below and start planning for the "Best Ever" contest now.

10. AWARDS

1. Plaque - "C.A.R.T.G."
2. Plaque - "RTTY JOURNAL"
3. Plaque - "C.A.R.T.G."
4. Plaque - "RTTY JOURNAL"
5. Plaque - A CARTG Member
6. Plaque - "RTTY JOURNAL"
7. Plaque - "C.A.R.T.G."
8. Plaque - "C.A.R.T.G."
9. Plaque - "RTTY JOURNAL"
10. Plaque - "C.A.R.T.G."
11. High Score U.S.A. Gold Medallion & Ribbon "RTTY JOURNAL"
12. High Canadian Score Gold Medallion & Ribbon Canadian Director ARRL Award
13. GREEN RTTY'er (First RTTY Contest). Sidney Burnett, VE3GK Memorial Plaque.
14. Most two-way RTTY 80 meter contacts. Plaque - "RTTY JOURNAL"
15. SWL Printer High Score Plaque - "C.A.R.T.G."
16. Low Power (under 100 w) Plaque - "RTTY JOURNAL"
17. Multi-Operated Stations Plaque - "C.A.R.T.G."

* ALL LOGS sent in will be eligible for draw prizes.
* Certificates for top scores in each U.S.A. and Canadian District and each Country.
* All Plaques and Medallions will be engraved with winner's call.
* CARTG Log Sheets and Zone Charts are available for SAE or IRC's. Use separate page for each band. Logs must be received not later than December 1, 1974 to qualify. Send to:

CANADIAN AMATEUR RADIO TELETYPE GROUP
(VE3RTT)
85 Fifeshire Road, Willowdale, Ontario, CANADA
M2L 2G9

SEPTEMBER 1974 5

RTTY ART MADE EASY

DON ROYER, WA6PIR
16387 Mandalay Dr.
ENCINO, CA. 91316

A few years ago you were asked if you had ever wished you could create RTTY art. It is still a great deal easier than you might think.

There is much basic art work available from which RTTY pictures may be made. Comic strips, magazines, newspapers, gatefolds, photographs and copies of works of art may all serve as bases for pictures. While these may not be the right size, an inexpensive child's pantograph or some types of Xerox machines may be used to enlarge or reduce them. A portrait of Washington was made from the etching on the dollar bill. Also, if you have a little sketching talent, that will help (or enlist the help of your wife and friends). Be sure to keep your left and right margin distances in mind when sizing your art and in selecting portions of large basic material. Remember that the width limits of most teleprinters will permit a picture of only a little over seven inches wide.

After selecting your subject and sizing the art work, run about four feet of paper from your printer. Use the center portion and carefully tape or glue the drawing or photo to the paper. Trim the edges to the same width as your paper. Now remove the paper stock from your printer and insert the four-foot sheet whereby the sketch is presented to you as it rolls over the platen. Carefully align the edges of the paper on the platen. Use your line feed to bring the top of the sketch into view. You are now ready to type the first run of your proposed picture directly upon the sketch, punching a tape as you go.

A small selection of characters is all that is needed to produce either outlined or shaded pictures. Study the letters and other characters to learn their individual densities. For example, the M and W are the darkest, followed by the H or X and then by the I. Thereafter, you can use the upshifted characters such as the : or ; followed by the " or - or . and the like, depending upon where you want the print to fall. In this way, you may add the shading that you desire or leave certain areas blank like this:

MMHMHIIHII:::..'. :.:I:IIHHMMHMM
going from dark to light and back to dark again. Due to their shape, you may also desire to use the V, A, F or L at the beginning and ends of dark areas to obtain smooth edge lines and perhaps accom-

panied by an apostrophe or period. With a little practice, you will be able to tell just where any character will strike the paper. Do leave blank or white areas whenever possible and don't try to fill the entire line with characters since this is a black and white (hopefully you have white paper) picture and you must rely upon the contrast to produce the desired detail. Continue the typing process over the entire sketch.

Now remove the sketch from your printer and reinsert your paper stock. Play out the tape you have made. You will probably be pleasantly surprised. Use a red pen to indicate on the print where additions, corrections and any changes are to be made. Rerun the tape (having folded the marked-up print and following it line-by-line using the paper holder and line guide on the printer) to make corrections, punching a new tape at the same time. In most instances, a good picture may be made with a series of five or six correction tapes.

When typing on the sketch, it helps to have a strong light directed onto the sketch in your machine. This is particularly true if the contrast of the sketch is poor, as may be in color photos. Also, since you will be unable to see the part of the sketch below the ribbon, a pencil may be used to outline the areas where the shading will change from one density to another. You may thus be able to produce a more complete picture the first time thru. Some of the RTTY artists have found that it helps to make Xerox prints of the original sketches or photos and to use those for their art work, as this eliminates some shading and provides a black and white format from which to work.

Keep the detail of the original art work as large as you can and don't be afraid to experiment with different letters and techniques. Do clean up your tapes. This may be done during the first run-thru after the typing to remove any extra characters that crept in by mistake. To give you some idea of the time required to complete the pics, about 20 hours is needed for one of the playmates that runs 30 minutes or so. Most of this will be in making the corrections and in rerunning the tape. Even after they are apparently finished, hang your creation across the room to see how it looks from a distance and then make a final tape with the finishing touches, increasing or decreasing contrast in certain areas and cleaning up edge lines. Time and patience!!

As many modern machines have non-overline features, it is generally well to

avoid overline printing. Good, non-overlined pics may be made by using the various character densities to create desired contrast. Stay within a 72 character line. Start and end the tape with a series of LTRS or blanks, a single carriage return and about ten line feeds. Keep in mind those machines which downshift on space as well as those which do not. If you are upshifted, and then space and wish another upshifted character, put in another FIGS character. Of course, the same applies when you want a letter following a space after an upshifted character and another LTRS must be added. At the start of each line, use one carriage return, the line feed and one LTRS unless the first character of that line is upshifted and requires a FIGS.

Again, make your tapes as short as possible by taking out any unneeded characters, extra LTRS, FIGS followed by LTRS and things like extra spaces or LTRS at the end of a line. Above all, be sure to put your credit line at the end, with the hope that others will follow your lead and keep it there.

There is one further situation you may wish to consider. An increasing number of machines do not use the standard communications keyboard. On these machines, the apostrophe and the bell are switched from the more normal arrangement of the apostrophe over the "J"

and the bell over the "S". To enable the pictures to be printed on either machine, it is only necessary to use both of these characters. That is, every time you use an apostrophe follow it immediately with a bell. This, of course, will produce a lot of bell ringing during reception but will enable full and accurate print on either type of keyboard arrangement. Most of the commercially available picture tapes are formatted in the suggested manner.

If you make or obtain pictures that are in several panels, it is very important that your paper is very tight on your platen. Otherwise, the panels will not line up. In putting these panels together, trim the border from the left edge of the second panel and carefully align it with the appropriate edge of the first panel. You may have to compensate if the print is off a bit. The panels may be secured together with plastic tape or, better yet, with a small amount of white glue. For wall display purposes, if your paper is thin, the overlapped areas may be hidden by backing the finished print with blank paper.

So if RTTY pictures excite your imagination, how about trying your hand at making at least one? You may find some hidden talent.

EASY TAPE STORAGE

For the past several years I have been using a method here in my ham shack for storing the 11/16" Rtty Tape and it is "ready to go" whenever the time comes to use the tape. My problem has always been as to how to keep the tape organized and ready to go and not have it all bunched up and on the floor and about that time the tape tears. I do have a tape winder to roll the tape up and also an unwinder for use with the TD. I have tried the "S" method I guess it is called by winding the tape around my fingers and it seemed to me not to work out too successful and etc.

So this is how I have solved the problem and thought that I would pass it on to you for your consideration and possibly you might want to mention it to help somebody else out. When the tape comes off of the winder and I take it off the reel, I use "Twist-Ems" to hold the tape together. The "Twist-ems" is readily available in any garden and lawn store and probably in florist shops too. They come in 8", 16" or 100 ft. bulk lengths. The 8" lengths usually come in a package of 100 and costs between 30c to 40c for one package. I simply wrap the "Twist-Ems" from the outside to the inside and it holds the tape tight and neat. The "Twist-Ems" can be used many times, is simple, cheap and quick to use.

Dr. H. B. Ludwig, K7YOZ

COLLINS 32S-3 AUDIO

E.H. CONKLIN, K6KA
402 Oliveta Pl. Box 1
LaCANADA, CA. 91011

Recently, when listening to some comments on the air, I was reminded of an item that I wrote up for HAM RADIO Magazine, October, 1971, page 64, about the two audio stages in the Collins 32S-3 exciter. This may help to explain some cases of white-noise output while using this exciter to transmit AFSK RTTY signals. Also, it may explain some cases of "second signal" a kHz or two away from the desired one.

The 32S-3 has an unusual input circuit -- the gain control follows the two audio stages. Often, when there is a fairly strong audio input, the gain control is set at a low level. In the meantime, the audio input may exceed the linear region of these stages, and become distorted and limited. This would permit white noise to rise compared with the signal, and also the production of some harmonic content. The solution

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TUNING THE OA-5 TU.

CONTINUED ON PAGE 17
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RTTY theory & applications.

RON 'RG' GUENTZLER, W8BBB
Route 1 Box 30
ADA OHIO, 45810

RTTY for Beginners- Part 15

SUMMARY

For the past 14 issues we have been describing some of the fundamentals of RTTY. This has been done to give an overall picture of the various aspects of RTTY to someone who is new to the "art." We have now completed the series, and will summarize what has been said.

THE TELEPRINTER

Printing telegraph machines communicate with each other (and within themselves) by means of a code commonly called the Baudot code. (Actually, it is not the Baudot code but the Murray code which is used by the common Teletype machines. For an extremely good discussion of the historical and present aspects of printing telegraphy see: "Principles of Telegraphy (Teletypewriter)," Navships 0967-255-0010, June 1967, SD catalog number: D219.8:T23; the price was \$1.50. The code is composed of five even-length "pulses" or elements. Every character sent from a keyboard contains the five pulses. This is unlike the familiar hand-keyed "CW" code which contains many different length characters. The teleprinter requires that all characters be the same length because both the sending and receiving machines are mechanical things, and mechanical things are best suited for operation under repetitive conditions. (The same argument applies to the all-electronic keyboards and "printers," but the problem is not as severe with them.)

The code is generated by the keyboard. When a key is depressed, the machine translates the letter to be sent into the proper code combination corresponding to that letter and then sends the code. The receiving machine receives the code for a given character, then selects (or decodes) the character being received, and prints it. It should be noted that a complete teleprinter, although it may, from the outside, appear to be similar to a typewriter, is actually quite different inside. Basically, it consists of two completely separate and independent machines - a sending unit called the keyboard and a receiving unit called the printer. Usually the only thing common between the two units is the motor which drives both of them and the cover which is used to keep dirt and fingers out and the noise in. (Can't say it is very suc-

cessful at any of those things!)

The "pulses" in the code used by teleprinters consist of an open circuit, called a Space, and a closed circuit, called a Mark. Because there are only 5 "pulses" per character, only 32 characters are possible. More than 32 characters are needed (just the 26 letters and 10 digits equal 36, and some punctuation is desirable, etc.). Therefore, most of the code combinations are used for two different characters; this explains why the keyboard is different from that of a typewriter. The dual use of characters is accomplished by shifting the machine into "Letters" or "Figures" position. Once a shift is accomplished, the receiving machine prints the characters corresponding to that shift position until a shift of the other type is received. (An exception to this is found in some machines which are equipped with an "unshift on space" arrangement whereby a shift to "Letters" occurs whenever a LTRS or a character space is received.)

Although only 5 elements are used in the teleprinter code to convey information, two other elements are needed. (Therefore it is called a 7 or 7.42 unit code.) One of the additional elements is called a "Start pulse", it is always a Space, and it precedes the first actual character code element. It was explained that the start pulse is needed to alert the receiving machine that a character is coming, and it is used to start the timing process within the receiving machine. The other extra element is called a "Stop pulse." It is always a Mark and it follows the last character code element; its purpose is to provide a period of time between the end of one character and the beginning of the next character so that the receiving machine can finish the decoding process and start the printing process before the next character arrives.

THE LOOP

A Teletype machine is made to communicate with itself or other machines by connecting the keyboard contacts and the selector magnets into a series circuit along with a variable resistor and a DC power supply of at least -130 volts. Essentially any number of machines can be connected into this series loop, although too many selectors will tend to distort

the code pulses and may cause errors. Once the machines have been connected, the variable resistor is adjusted until 60 mA is flowing in the loop. The voltage across the selector magnets in any machine is irrelevant; the current flowing is what is important - however, the power supply in the loop must have at least 130 volts.

TRANSMITTING

The opening and closing of a loop by the keyboard can be transmitted by radio using two different, but closely related, methods.

In one method, called audio frequency shift typing (AFSK), the keyboard contacts are connected to an audio frequency oscillator; an oscillator built for this purpose is called an AFSK keyer. When the contacts are closed (Mark), the output frequency of the oscillator is 2125 Hz. When the contacts are open (Space), the frequency is 2295 or 2975 Hz (depending upon whether narrow or wide shift is being used, respectively). The output of this oscillator is connected to the audio (microphone) input of a voice (DSB AM or FM) transmitter. AFSK is usually used on 2 and 6 meters. AFSK when used with a DSB AM transmitter is called A2 modulation and when used with an FM transmitter is called F2 modulation.

The other method of transmission is called frequency shift keying (FSK). The keyboard contacts are connected to the oscillator in a CW transmitter. The connection to the oscillator tuned circuit is made, thru a diode and an RFC. (The actual circuit depends upon the specific make and model of the transmitter and upon the method of connection from the keyboard.) When characters are sent, the contacts on the keyboard open and close and this changes the frequency of the transmitter. The frequency change is very small; usually, the Space frequency is either 170 or 850 Hz below the Mark frequency. Note that unlike CW, the transmitter is on the air continuously; the only difference between a Mark and a Space is a slight difference in the output frequency of the transmitter. FSK is usually used on 80 thru 10 meters. FSK is called F1 modulation.

FSK can also be generated by a hybrid of the two methods just described. The output of an AFSK keyer is fed into the audio input of an SSB transmitter. Because the transmitter suppresses one sideband and the carrier, the output signal appears identical to that of a directly generated FSK signal.

RECEIVING

When receiving an AFSK signal, the receiver is tuned as it would be for a voice signal. The output from the receiver is connected to the input of a terminal unit (TU). The output of the TU is connected into a loop containing the selector magnets of a teleprinter. The

TU "listens" to the tones. When a Mark tone is received, the TU allows current to flow in the loop; when a Space tone is received, the TU stops current flow in the loop.

FSK is usually received in a manner similar to CW. The BFO in the receiver is turned on and the FSK is automatically converted to AFSK by the receiver. The receiver tuning is more critical than it is with CW because the receiver tuning determines the frequencies of the AFSK signal appearing in the output, and the frequencies must correspond with the frequencies for which the TU is built. Once the receiver has converted the FSK signal to AFSK, the remainder of the receiving process is the same as it is with AFSK.

AN OVERALL VIEW

The whole sending and receiving process can be summarized by saying that when the keyboard contacts are closed, the transmitter sends out the Mark frequency; the receiver output will be a Mark tone and the TU will close the receiving loop. When the keyboard contacts are open, the transmitter sends out a Space frequency, the receiver output will be a Space tone, and the TU opens the receiving loop.

VHF NEWS

The 6th Annual B.A.R.T.G. VHF RTTY Contest will be held Saturday SEP 14 and Sunday SEP 22. Operation is to be only by stations within Zones 14 and 15. This year the contest will be only on the 144 and 432 MHz bands. For more information about the contest write to: Ted Double, G8CDW, 89, Linden Gardens, Enfield, Middlesex, England. The logs are to be sent to: B.A.R.T.G. VHF Contest, c/o Eric Yeomanson, G3IIR, 32, Gaynesford Road, Forest Hill, London SE23 2UQ, England. We will publish the results in this column.

We are very interested in publishing VHF RTTY operating information. The information does not have to relate to anything "spectacular," just who's doing what, where. Also, if there are any technical topics that you would like to have discussed, please write and ask or suggest. 73 ES CUL, RG.



"Uli" DK3CU

SEPTEMBER 1974 11

RTTY-DX

JOHN POSSEHL - W3KV
Box 73 Blue Bell, Pa., 19422



Hello there...

Those of you in the more northern latitudes must have enjoyed viewing brilliant displays of the "Northern Lights" over the past several weeks. It surely must have been that way, as propagation conditions hit an all time low in these parts during the Summer months. There were some brief moments of "how it used to be" and we will try to summarize them in the following paragraphs.

The SARTG Contest which took place on or about the time you read this no doubt generated some much needed DX activity. Due to be active in this one were OYIM, and OX3XX, and OX3JW. We understand that the main reason these fellows have not been active sooner has been due to TU problems and the SARTG was trying desperately to get this resolved before Contest time. We hope to have a report on the Contest activities in the next issue.

San Marino was reported active in early July with RTTY signals on 15 and 20 meters by MIA using 850 hz shift.

A new station has been very active from Yugoslavia recently. Anton YU3EM, puts strong signals into the States when the band is open.

A recent contact was made with Alex, UK1Zab. He was sending at 50 baud at the time and claimed to be operating from a ship in Murmansk harbor.

Along with the recent issue of the BARTG "Newsletter" was included the latest membership list. Among the approximately 280 members listed there was a score of calls bearing the GM, GW, GI, prefix. Some of these boys would create quite a disturbance if they would venture into the high frequency bands, 14 mhz in particular. Of very particular interest is the call GC3FKW on the island of Jersey. Need we say more!!! In addition there is listed a popular call of a couple of years back for which we still receive requests as to his whereabouts. This is 9J2ED, Ed Thompson, and he is listed as being at P.O. Box 50, Livingstone, Zambia.

Skipping over to the Americans we hear recent activity from Fred, FM7WW, who joins Frantz FM7AA, Andre FM7WB, and Fernand FM7WN, in making Martinique very QRV on RTTY.

By this time you have no doubt had a

HONOR ROLL-100 DXCC

ON4BX	134 Confirmed
W3KV	131 Confirmed
ON4CK	129 Confirmed
W5QCH	111 Confirmed
DK3CU	111 Confirmed
W5EUN	110 Confirmed
WA3IKK	110 Confirmed
W2LFL	107 Confirmed
W8CQ	104 Confirmed
ISROL	104 Confirmed
W3DJZ	103 Confirmed
G6JF	101 Confirmed
ISKG	100 Confirmed
W4YG	100 Confirmed

50 or OVER CONFIRMED

1. JA1ACB	122/100	16. K3SWZ	71/65
2. K8YEK	102/99	17. EI5BH	76/62
3. ZS3B	103/94	18. OK1MP	68/62
4. ISWT	100/92	19. ZL2ALW	63/58
5. K6WZ	91/87	20. CE3EX	75/57
6. DL8VX	93/85	21. SM00Y	67/57
7. W4CQI	92/81	22. K6YUI	64/55
8. W1GKJ	84/79	23. W3EKT	66/54
9. WA2YVK	90/75	24. KH6AG	73/53
10. W4EGY	82/74	25. SM5BO	60/52
11. DJ8BT	78/74	26. W0HAH	62/51
12. W8JIN	78/70	27. HB9AKA	62/51
13. W2PLO	77/70	28. W0MT	58/51
14. LU2ESB	96/69	29. OZ4FF	67/50
15. G8LT	73/69		

UNDER 50 CONFIRMED

1. XE1YJ	58/49	10. SM6EZD	35/30
2. ON5WG	57/49	11. W7BCT	41/29
3. W5TZB	51/44	12. HB9ACQ	40/29
4. F5JA	55/43	13. DJ0RR	49/28
5. W8CAT	45/43	14. DL0AK	49/28
6. HB9HK	56/42	15. PY6HL	33/23
7. G3LDI	58/39	16. PA0WDW	39/20
8. VK6PG	53/38	17. W0LZT	33/14
9. ON5CZ	60/31	18. WA0TAS	31/11

contact with VP2MRW, who is really Knobby, W2PLQ, and down there for a visit with Sid. This event was due to happen at the end of July but had not yet occurred at this writing.

Wolf, DL8VX, of the GARTG, was a long way from home for several weeks this Summer. He was in Vancouver, B.C. and although licensed as

DL8VX/VE7 he did not have an opportunity to operate as the University station, VE7UBC, was closed down for the Summer holiday and Alan, VE7LL was also away on vacation.

FY7AO has been joined by Serge, FY7AK in making contacts with French Guiana more accessible. Of interest to you certified hunters, a special Diploma is also issued for contacts with 4 stations located in KOUROU (on any mode). I will furnish details and application form if you send me a SASE. All the information is in French.

Over in Ecuador Ben, HC1DL, has been very active and is setting up a complete RTTY station at the Quito Radio Club, HC1QRC, for use by its members. Everything is presently installed except for a decent receiver but it should not be too long before one is found. QTH for the station is --

Quito Amateur Radio Club
P.O. Box 289

Quito, Ecuador.

You can QSL to Ben HC1DL at the same QTH.

Just a bit further to the South, old timer Zip, OA4BR is again going strong. A new S-Line and machine has been installed and a linear will soon follow. Activity from Peru has been lacking in recent months and Zip's return to the mode is most welcome.

You will probably find some recent Contest results on other pages but a standing ovation is in order for -- SM4CMG, winner of the BARTG Contest; KZ5BH, overall winner of the WAEDC Contest; IIBAY, this years World Champion who had top score average of all Contests held in 1973.

There are some interesting possibilities to catch some rare DX in the Pacific area. VK9XW on Christmas has been quite active. JA1ACB and KH6AG are among those that have had a contact with Craig and a QSL comes very quickly via his manager, who is --

J. E. Rumble, VK6RU

43 Pandora St.

City Beach 6015

Western Australia

We have tip-toed down to the shack a few times at 0800z (4 a.m. local) hoping to find him during his usual operating times but all we hear around here is receiver noise with no signals in any mode at that hour.

In mid July we were pleasantly surprised to contact a new station in Port Moresby, P29JF, and John is the operator. The Qth is the same as given for Mac, P29MC last month. As regards Mac, we are advised by his QSL manager that you will get the card a lot faster going via -- Norm Koch K6ZDL

P.O. Box 1351

Torrance Ca. 90505

On Marcus there is, or was, activity from JA8IEV/JD1. His name is Masa and he was due to be there until the latter

part of August. QSL via --

Kazuo Kumanaka, JA8JL

237 Fukuzumi

Toyohira, Sapporo 062 Japan

Should you miss Masa we understand that JDIAGZ has fired up again and should be available around 0800-0900z particularly on weekends.

Congratulations to the following stations upon receiving the WAC Award in recent weeks --

Nr. 226 Otto Klaeger	DJ1QT
Nr. 227 Norm Koch	K6ZDL
Nr. 228 Jim Trutko	W8EXI
Nr. 229 George Haller	W4AHX

A few words of interest about DJ1QT. Otto is quite active on RTTY via Oscar 6 and has made several contacts in Europe via the satellite. He will be looking for USA and other countries via this route and is getting set for the Oscar 7 launch in the near future. This will be the way to go in the years ahead and propagation worries can be forgotten.

The SARTG sends out a "MAYDAY" and hopes that someone out there reading this can help them. They have on hand a large quantity of Electronic Keyboards acquired via surplus and are desperately looking for a manual or any information at all so that they can make use of them. The unit is the "IKOR Electronic Keyboard, Model 6210EZ" and was manufactured in the USA. Direct your response to President of SARTG --

Karsten Tranberg, OZ4FF

Lille Torv 16

3700 Ronne, Denmark

Many thanks to W2LFL, K6WZ, JA1ACB, DK3CU, ON4BX, HC1DL, and others, we are grateful for your contributions.

DX-RTTY September 1964

Rumors of a CP station soon to be active, no call mentioned yet. Some new ones from Europe include G3HKK, F2FO, and IIAHN, FG7XT met with K3GIF on a recent visit to the States. KW6DS is active every Sunday from Wake Island. Down under most activity comes from VK3KF, ZL1WB, VK4RQ, now joined by Alec, ZL3HJ.

73 de John

RESULTS OF THE 6TH EUROPEAN RTTY-DX-CONTEST 1974

Winners of RTTY - WAEDC-Plaque 1974

1. KZ5BH William Hemingway, Canal Zone
2. LU2ESB Henri Coste, Argentina

NORTH AMERICA

KZ5BH	28380	111	199	55 B
W3EKT	18900	92	84	45 B
K6WZ	16112	81	157	53 B
K4GMH	9730	68	38	35 B
W0MT	5841	45	82	33 A
W8JIN	3618	30	54	27 B
W1GKJ	3240	31	45	20 B
W7BCT	1680	23	20	20 B
VE4SC	1342	31	5	22 B
W8CAT	1152	20	—	18 B
WA4JTY	728	18	—	14 A
W1MX	646	17	5	17 B

SEPTEMBER 1974 13

- 3 Speed Clock for UARTS.

NOEL J. FOX, KH6FOX
1615 Wilder, Apt. 401
HONOLULU, HAWAII, 96822

The use of UARTS, as advocated by Hoff, Et Al (This Rag, April and May 1974) calls for the construction of multiple clock frequencies, each at 16 times the desired baud rates. A study of these baud rates in terms of their periods, rather than their frequencies, suggests a direct approach for deriving the desired frequencies.

Table 1 suggests that three of the most useful baud rates involve periods which are almost exactly multiples of one-half

millisecond. Thus direct counting chains, driven by a one-half millisecond (2 Kcs.) clock, could be provided with appropriate feedback to present these baud rates. Moreover, the errors are nicely located where we would like to have them, being less than half a percent on the two radio-type baud rates, and only one percent on 110 baud, which might be used for a local ASCII loop where a bit of bias is not important.

The UART wants a clock frequency of 16 times the baud rate. Thus the actual frequency needed into the counting chains is 16 x 2 Kcs., or 32 Kcs. An entire three-rate clock, as implemented at KH6FOX, is detailed in Figure 1.

TABLE 1

BAUD	WPM	UNIT CODE	PERIOD MS.	NEAREST 1/2 Ms.	ERROR
45.45	60	7.42	22.00	22.0	0%
74.20	100	7.42	13.477	13.5	0.45%
	106	7.00			
110	100	11.0	9.09	9.0	1.0%

CURRENT LITERATURE NOTES.

For many RTTY readers, items and articles in current literature can provide useful ideas. My own personal goal in collecting and evaluating these ideas is a completely micro-computer controlled TU. The existence of a TU like this awaits only the time and expense of interconnecting already available commercial items such as microprocessors, solid state Phase Locked Loops, UART's, etc.

Even if you are only interested in simply finding some small piece of gear that could be useful in the shack, some of the following notes could be of value:

1. **ROHM XR-210 FSK Modulator/De-modulator.** This device is a completely contained Phase Locked Loop system in an Integrated Circuit package. The specifications are ideal for use in a home TU. It can operate on a power supply voltage range of 5 volts to 26 volts, a frequency range of .5 Hz to 20MHz, it has RS 232C output capability, etc. In other words, it is a completely self-contained TU for receiving and transmitting in a package about the size of your fingernail. I don't have any figures on the cost but you can contact the manufacturer or distributor for that. Write for a spec sheet to:

R-OHM CORPORATION
EXAR PRODUCTS
BOX 4455
Irvine, California 92664

2. **Interfacing a TTY with an IC micro-processor.** The July 25, 1974 issue

of **ELECTRONICS** magazine (page 96) contains a circuit for using a model 28 (or 15 or what-have-you) as an output device for a microprocessor. The author claims it can be built for about \$6.50 and is Baudot oriented. I think a UART could be used for the same thing and could also be full-duplex (transmitting and receiving) but the circuit is of interest. You can probably find a copy of **ELECTRONICS** for that date at your local public library.

3. **What can you do with a microprocessor?** An excellent article on the principles and applications of microprocessors. It is especially interesting since it uses an example of driving a paper tape reader (which could be useful for the shack). It appeared in the March 20, 1974 issue of **Electronic Design News**. You can probably get a free reprint and a lot of technical information on the microprocessor mentioned by writing to:

Pro-Log Corporation
852 Airport Road
Monterey, California 93940

I am also planning to list a number of articles on using home type cassette recorders as a recording medium in place of paper tape. There have been a number of articles recently on this subject. If you have any ideas or questions, write to me -

Fred Hatfield K8VDU
Computer Data Systems, Inc.
1372 Grandview Ave.
Columbus, Ohio 43212

USED TELETYPE MACHINES AVAILABLE

I have just had a large number of Teletype machines released to me by Western Union. These are mostly page printers: Model 19's, Model 15 KSR's, and Model 15 KSR's in floor consoles. The machines have been in storage, and some of them are still in their original factory crates, never having been put into service. Most of the remainder were given standard overhauls just prior to being placed in storage.

The Model 19's are complete with printer and keyboard, transmitter-distributor, perforator and character counter, and a heavy-duty steel desk. The heavy-duty power supplies are built into the desk.

The Model 15's are all KSR's (keyboard), and are in two styles. The first style is the standard cabinet, which is normally placed on a desk or table for operation. The second type is in a sound-proofed floor console, whose shape is somewhat similar in appearance to a Model 28 KSR.

Quantity Available	Item	Cost
33	Model 15 KSR	\$39.00 each
18	Model 15 KSR in floor console	46.00 each
17	Model 19 (ASR, complete)	79.00 each
18	Model 2-B strip printer with keyboard	5.00 each
16	Misc. perforators & reperforators, with and without keyboard	5.00 each
9	Transmitter-Distributors	4.00 each
	Misc. test equipment, etc.	1.00 to 4.00 each

All of these machines are equipped with WRU (who are you), and answer back (HERE IS) mechanisms which can be coded with up to 18 characters for automatic station identification at the touch of a single key.

All machines have synchronous motors, low paper indicators, etc.; and the cabinets, consoles, and desks are a pleasant light green color. All are in excellent condition.

In addition to the above, there are perforators and reperforators (both typing and non-typing; both with and without keyboards), plus strip printers (with

keyboards) and transmitter-distributors, but no statement can be made as to the condition of these. (For example, the end-of-line indicators need repair on most of the perforators). These all have synchronous motors, incidentally, which are interchangeable with Model 14, 15, 19, etc. gear.

Finally, there is a wide variety of miscellaneous test equipment, test tables, power supplies, polar relays, end-of-message readers, duplex repeaters, Siemens dial Telex gear, etc., plus a few parts for Models 14, 15, 19, and 32.

The equipment is to be released to any interested amateurs at cost, according to the following price schedule:

A few of the model 15 have 67 wpm gears - all others 60 wpm.

Of course, as with most equipment distributions of this type, there is no guarantee, and you can't get your money back. But, with the exceptions noted previously, the condition of the equip-

ment is very good to excellent, and is a genuine bargain.

Distribution will be on a first-come, first-served basis. I cannot ship (with the exception of the few pieces that are already crated), so purchasers must make their own arrangements for pickup.

For additional information, I can be contacted at the following address:

Bill Johnston, WB5CBC
1808 Pomona Drive
Las Cruces, New Mexico 88001

All inquiries must be accompanied by a self-addressed stamped envelope.

Collins 32S-3 Audio

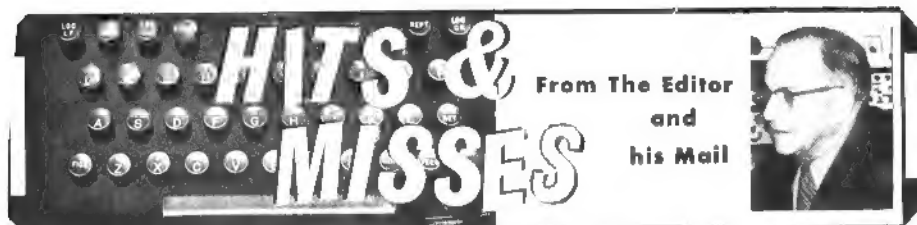
CONTINUED FROM PAGE 7

is to operate with higher "MIC GAIN", and lower audio input.

However, the best way to obtain this is to "lose" some of the audio in some helpful manner. In my case, I made an authorized Collins modification from a circuit used in some of the 32S-3's, which is to clip one lead from the 20 uf cathode by-pass capacitor, C183, which

is handily located on the back of the "FREQ CONTROL" at the left top of the panel. Also, I made another authorized change, by placing a half-megohm resistor from plate to plate of the audio tube, V1A and V1B, pins 1 and 6. Like the first change, this one adds degenerative feedback and some loss of gain, which was all to the good.

I suggest that all users of the Collins 32S-3 consider making these changes. -- K6KA



Sorry but there was no JUNE issue, of the Journal. We mentioned in the JULY-AUGUST issue of our goof in not adding MAY-JUNE on the mast head. It was a combined issue and has been for over seven years. We mention this again as we have received a number of letters, after the July issue was mailed, stating that the June issue was never received.

One request we get is for a list of commercial stations printing English at speeds and shifts that can be copied on the average ham equipment. If anyone has such a list we would like to publish it - state frequency (approx.) shift and speed if available.

We have spent a lot more time this summer in the garden and golf links than on RTTY. From the few times we have listened others must have found other things to do also as there has been little activity. Poor band conditions have not helped. With the first contest of the season, SARTG, just over about the time you get this maybe activity will start picking up. One thing we would like to see is a lot of interest in the RTTY Art Contest. No elaborate set up is necessary and this is one event the VHF boys can enter as all it requires is that the pix be sent to one person via RTTY. With all the localized 2 meter activity a number of entries should come from these groups.

So far, only one answer to our request for anyone willing to serve on a Technical RTTY answer department. Anyone willing to serve on any phase of RTTY is invited to let us know their specialty and we will try to publish them each month.

INFORMATION AVAILABLE ON;

TELETYPE MACHINES, all models, write to Neil Petlock, K9WRL, 104 N. Emerson St., Mt. Prospect, IL. 60056.

When requesting information please give as complete a resume of the problem as possible and ALWAYS include a SASE.

BACK ISSUES

New subscriptions and classified ads are cash in advance as we have no method for billing. New subscriptions will be started with the current issue and one back issue, if requested. Please do not ask us to start any further back than this. Back issues - if available - may be ordered at 30¢ each at time of subscription. The JOURNAL is mailed about the 20th of the month preceding the dated month. May and June are a combined issue and July-August is a combined issue.

The ONLY back issues available are listed below. 30¢ each.

1966-Oct. [1]
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Nov. - [5]
1972-April-May-July-Sept.-
Oct.-Nov.-Dec. - [7]
1973-Complete-[10]
1974-Complete to date[6]

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Royal Oak, Mich. 48068

Editor & Publisher 'Dusty' Dunn, W8CQ

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RTTY JOURNAL

BINDERS \$ 3.50

Tuning OA-5

CONTINUED FROM PAGE 9
for mark and space.

Although the bandpass filter can be tuned, experience has shown that this is really not necessary. Using the components stated, the filter is about 1000 Hz wide at its 3 db point, and almost always falls within the prescribed limits for this type of filter. If one desires to tune it, it is best to refer to Hoff's articles on the ST-5 and ST-6. **AUTOSTART SECTION:**

There is only one simple adjustment in the autostart section. If any problem arises in the autostart, it is usually because of solder bridges, or diodes installed backwards.

The trimpot in the right front corner of the OA-5 should be adjusted so that signals turn on the autostart at the desired point. It is possible to set this so that only signals with exactly the correct shift turn on the autostart, or to have it adjusted so that it will turn on with almost any shift. This is a matter that is up to each individual operator, and his operating habits. In general, it is best to set the pot so that signals about 75 to 80% of the regular reading on the tune meter turn the autostart on. The easiest way to adjust this is to turn the OA-5 to "fast" autostart, and to set the meter to desired "turn on level" then trim the pot so that the green receive light just comes on. Slight modifications to this setting may be desirable after the unit is placed in use.

AFSK SECTION:

The AFSK has three adjustments. These are to set the tones that are transmitted. These should be adjusted 2125 (mark, front trimpot), 2295 Hz (170 shift space, middle trimpot), and to 2975 Hz (850 space, rear trimpot). It is assumed that by this time most amateurs either own a frequency counter, or have access to borrow one temporarily. The counter should be connected to the AFSK output. The low Z, high level output provides about half a volt of audio, and should be more than enough to drive any counter.

In some cases, maybe even most cases, it may be that the trimpot will not be of sufficient range to set the frequencies to those indicated. Fixed resistors are provided in series with each trimpot. These may need to be shorted. The values of these resistors are chosen, so that a jumper can simply be connected across the appropriate resistor. For example, the 82 K is series with the 100K pot can be shorted out, to change the range of the 170 space tone.

Be sure to adjust the 2125 Hz mark tone first. All other tones depend on this. It makes no difference if the 170 or 850 space is adjusted next.

The output filter of the AFSK generator does not normally need to be adjusted; the values given are accurate enough.

ADDITIONAL COMMENTS:

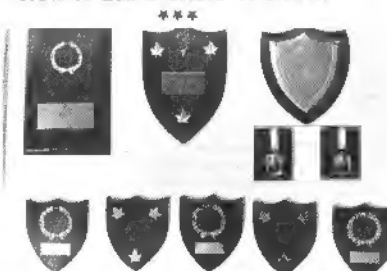
100 speed: If 100 WPM speed is desired, it would be best to change the .068 uf capacitor from the junction of the 100K resistors and the input of the op-amp to a .039 uf. Do not switch this; simply change it, and leave it alone.

709 op-amps: Op-amps of the 709 variety come in at least three different case style. The DIP and half DIP fit directly on the board. The TO-5 type case (small round metal can), can also fit, with a slight bending of the leads. Turn the op-amp so that its leads are facing up. Note the location of the little tab. Place this little tab so it is at an 11 o'clock position. Separate the leads into two groups of four leads each, dividing them so that a line is made from 12 o'clock to 6 o'clock. These leads are now the same as the pins on a DIP package. The tab goes to the same end as the marked end of the DIP package.

Components: Always check your parts to be sure they are good before installing them. This is especially true of diodes and transistors, and applies to any project, not just the OA-5. Be certain to clean the leads of each component before installing it on the printed circuit board.

The OA-5 has met with much success. Its construction is greatly simplified by having everything on one circuit board. When everything is aligned properly, I have been able to copy signals that I can't hear from the speaker. Its autostart functions flawlessly, and draws almost no electrical power (actually about 5 watts) while not receiving a signal.

Now to add a UART to it!!!!



CARTG SWEEPSTAKES AWARDS

SEPTEMBER 1974 17

CLASSIFIED ADS- 30 words \$2. Additional words- 4¢ ea.

Cash with copy, Deadline 1st of month.

MORE RTTY! ONLY HAM RADIO MAGAZINE consistently brings you more RTTY articles and better RTTY articles than any other general amateur magazine. You need RTTY Journal, but you need HAM RADIO also. \$7.00 per year, \$14.00 for 3 years. Ham Radio, Greenville, NH 03048.

TELETYPE EQUIPMENT FOR SALE: Models 14, 15, 19, 28. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices. L. Pfeiffer, 10615 W. Ridge Rd., Apt. 54, Hales Corners, WI 53130.

CHICAGO AREA OPERATORS, EXPERT REPAIR work performed at reasonable prices. Cleaning and lubrication; printers \$11.00, Keyboards \$6.00, Reperfs \$8.00. Repair work, any model teletype apparatus, \$17.00 plus parts. Phone (312) 382-2358. Contact Neil.

WRR 2A/FRR-59A-need synthesizer chassis complete, Part A20258-2, or 140 kc BP filter #C38253-1. Will buy junk set for parts. J. D. Wood, 201 Montebello, Charlottesville, Va. 22903. (804) 295-2857.

WANTED: TTL/2 that is on the shelf collecting dust. Send price and any other info. Will return letter postage if requested. Bill Carathers, K5CLH, 134 Juniper, Hereford, TX. 76045.

CIRCUIT BOARD SET for "Low Cost Kity Counter" Oct 73 Journal. Includes two counter modules, PET front end, 60 hz time base, and a bonus scaler board. Scaler will operate to at least 220 mhz. Boards are G-10 epoxy, plated, undrilled, with full size photos showing each assembly. Necessary info included. Set \$10 postpaid in U.S., add \$8 for Universal Frequency Standard Board. Bert Kelley, 2307 S. Clark Ave., Tampa, Florida 33609.

NEWS-NEWS-NEWS - Amateur Radio's Newspaper, "Worldradio". Trial subscription-Two issues for one dollar. "Worldradio" 2509-F Donner Way, Sacramento, Calif. 95818.

MODEL 24 LESU's: BELL TYPE, LESU-8. Complete wiring for 28KSR, contains loop supply, casting with 4 "horns", polar relay socket less relay, etc. \$15.00 each plus shipping. L. Pfeiffer, 10615 W. Ridge Rd., Apt. 54, Hales Corners, WI 53130.

WANTED: CV483/URA-17 group, will pay \$200.00 cash. Also want RO Mod. 28 Mark III printer. Also need model 28 printing reperf, unit only. George Tate, W4AIS, 300 Thornwood Dr. Taylors, S.C. 29687

TELETYPE RIBBONS, Black nylon, fresh stock - \$3.95/DOZEN, 50¢ each, plus postage (2 pounds per dozen). CV-89 SCHEMATIC and 14 important pages copied from NAVSHIPS manual. \$2.95 postpaid. 11/16" PERFORATOR TAPE, \$2.95 for ten rolls, \$8/case of 40 rolls plus shipping (49 pounds per case). JIM COOPER W2BVE, Communications Equipment, Supplies and Information, P. O. Box 73-T, Paramus, NJ 07652.

HAL COMMUNICATIONS CORP. announces the DKB-2010 Dual Mode Keyboard. Provides flawless transmission of RTTY and Morse Code with standard 3 character buffer and optional 64 or 128 key buffer. Call letter identifier and "Quick Brown Fox" sequence standard. Write for detailed spec sheet. HAL Communications Corp., Box 365RJ, Urbana, ILL. 61801 Phone 217-359-7373.

PHOTOSTAMPS OF YOUR STATION with gummed backs for your QSLs. 200 Mini stamps \$2.50 - 100 Midi stamps \$2.00 - 50 Maxi stamps \$2.00 - Samples 25¢. Morgan 883 Diana Akron, Ohio 44307.

WANTED - 3ASR, B. A. THUNMAN, W8ISG, 71 McCollum Street, Galesburg, Michigan 49053. Phone 616 665-7071 or 731-5164.

TELETYPE - KLEINSCHMIDT - MITE - gears, parts, manuals, tape (11/16, 7/8), toroids, SASE for list. Typeironics, PO Box 8873, Ft. Lauderdale, FL. 33310. Wanted; Tubes 122, 2BP1, Kleinschmidt TD, 60 speed gears, also Mite 75, and 74912 - trade 74913. W4NYF.

DIGITALLY CONTROLLED VFO SYNTHESIZER covers 5-8 MHz in steps of 100 Hertz and with accuracy and stability to one Hertz. Set your frequency with four thumbwheel switches (included in price) or "tune" it with automatic or programmable means. Spurious outputs down at least 60 dB. Direct outputs 50-60 MHz and 100-120 MHz also provided. All on one 4X6 circuit board for \$245. Universal audio, AFSK, and VLF synthesizer covers 0 to 100 kHz in one Hertz steps; kit \$135. Programmable RTTY stunt box answers your message when someone calls your station; coming soon. Sase for information of these and other RTTY products. Petit Logic Systems, Box 51, Oak Harbor, Wa. 98277.

88 MILLIHENRY TOROIDS, clean, unpotted. Ship-postpaid in the US. Bakers dozen (13) for \$5.00. T-C-V Co. Box 4117, Alexandria, VA. 22303.

SALE: MODEL 28 TYPING REPERF, type TT 315/UG code LPR-35, or TT 317/UG code LPR-37, tape data 11/16" wide, chadless or fully perforated; Good \$25.00 each. Model 28 transmitter-distributor type TT 334/UG code LXB-9, Good \$25.00. Tuning forks 96.19 VPS. or 120 VPS. Unused \$2.00 each. Mite PD/82U 115 VAC, 60 Cy. Synchronous motor with connector Unused \$18.00. Reader, High speed Ferranti model 11 or 111 Good \$15.00. TT Socket wrench 5/16" with 12" long handle Unused .75¢ each. 60 WPM set of gears for Model 14 T.D. 1800 rpm Unused \$4.75. Model 14, 15 and 19 Machines available as well as others and parts also. Send us a list of your needs. Atlantic Surplus Sales, 1902 Mermaid Ave., Brooklyn, N.Y. 11224.

88 AND 44 MILLIHENRY TOROIDS, unpotted, \$5.00 per Doz. TELECOM, Box 411, Alexandria, VA. 22303.

HAL COMMUNICATIONS CORP.: HEADQUARTERS for MAINLINE Solid State RTTY Equipment. In demodulators, choose from the incomparable ST-6 or, for a low cost beginning in RTTY, the ST-5. Tailor either to your requirements by selecting the 425 Hz press discriminator, the AK-1 AFSK oscillator, and table or rack mount cabinets for the ST-6, or the AK-1 AFSK and the ST-5/AS autostart for the ST-5. Full details available in our current catalog. Charge your purchase to your BankAmericard or Master Charge account. HAL Communications Corp., Box 365RJ, Urbana, Illinois 61801. Phone 217-359-7373.

FOR SALE: DX-60B MINT CONDX. \$65.00, HG-10B VFO mint condx \$25.00. HW12 good condx \$65.00. DX-35 good condx \$25.00. AK-1 with AC power supply \$25.00. Collins 62S-1 transverter mint condx \$475.00. Model 14 typing reperforator with keyboard \$45.00. Model 14 TD, \$25.00. All are in mint condition with sync motors and manuals. One set ST-6 printed circuit boards (8 by W6FFC) \$10.00. 4-400 tubes, good, \$10.00 each. Chimneys for 4-400 \$5.00 each. Kepco power supply model SC-18-4M good condx \$35.00. 28 vt 5 amp DC supply \$20.00. W.L. Brown, W5NRD, 425 Magnolia St., Denton, TX/76201. Phone (817)-382-0351.

CLASSIFIED ADS-

FOR SALE: TYPE 19 PRINTER Perforator machine part of 19 ASR set, clean and adjusted \$75; Perforator-keyboard \$35; Type 14 Typing-Reperf with keyboard, overhauled and adjusted \$45; local pick up or delivery only; consider trades; need distortion analyzer; TUconverter for 2 meter AFSK. Call (817) 232-1506 Len Hoops W5JTA, 1704 Glenn Drive, Fort Worth, Texas 76131.

SAROC TENTH ANNIVERSARY NATIONAL CONVENTION January 2 - 5, 1975 in Del Webb's Hotel Sahara Space Center. QSL for registration and special airfare information. SAROC, POB 945, Boulder City, Nevada 89005.

WANTED: TELETYPE MACHINES also parts and accessories for Models 28, 32, 33 & 35. Call or Write: A.D.M. Communications, 1265 Simpson Way, Escondido, Calif. 92025 (714) 747-0374

WANTED: CV483/URA-17 group, will pay \$200.00 cash. Also want RO Mod. 28 Mark III printer. Also need model 28 printing reperf, unit only. George Tate, W4AIS, 300 Thornwood Dr. Taylors, S.C. 29687.

WANTED: MODEL 33 & 35 EQUIPMENT. Complete or partial units, any quantity. Will pay shipping. Terminal Systems, Inc., 11300 Hartland St., North Hollywood, CA 91605 (213) 769-6772.

WANTED: LTPE-1 PERFORATORS; LRB-6 Underdone reperforators - must have 3-speed gear box. Also interested in Models 28, 32, 33, 35 & 37s. Will pay top price. Amber Industrial Corp., Phone 201/824-1244.

HAL COMMUNICATIONS CORP. can provide you with the proven video display system, the RVD-1002. When coupled with the RKB-1 keyboard, you will have the ultimate in noiseless, reliable reception and transmission of Baudot coded RTTY. The RVD-1002 receives TTY pulses from the HAL ST-6 or any other demodulator, and generates a 1000 character display. Copies at all four standard speeds with selectable unshift on space. The RKB-1 features a high quality commercial keyboard, reliable solid state circuitry, and a rugged, attractive cabinet. BankAmericard and Master Charge now accepted. HAL Communications Corp., Box 365RJ, Urbana, Ill. 61801. Phone 217-359-7373.

M32RO, M33RO TELETYPES: Prices from \$150 to \$275 FOB. Also fast parts service on all 32/33. K1YCM Les Veenstra, ACTON TECHNICAL SERVICES, 919 Crystal Springs Ave., Pensacola, Fla. 32505. 904-434-1297.

HAL COMMUNICATIONS CORP WILL DISPLAY THE line of RTTY equipment at Melbourne, Findlay, Cincinnati, Peoria, Radio Expo, Hamburg, and many other shows. Phone your orders for pickup at the show. HAL Communications Corp., Box 365 RJ, Urbana, IL. 61801, Phone (217) 359-7373.

"SHORT WAVE LISTENER" Entering RTTY hobby needs good equipment. Most urgently needed are: TU, paper, ribbons and information on setting up receiving station. Advise what for sale - conditions and price. Mark Endelstein, WDX9ME, 6545 N. Hazelwood Ave., Indianapolis, Indiana 46260. Air Mail preferred.

SELL: M28KSR SKINTIGHT MK III, mint, \$250.00. M28 self contained LXD TD, \$75.00. M28 50/60 hz governed motors, \$10.00. Collins R648/AAR41, converted, \$295.00. Frederick model 1500 RTTY receiver, xials, \$295.00. TMC STR-1 solid state xtal controlled HF receiver, \$175. Northern Radio Model 174-1 diversity converter, \$85. SASE for RTTY list. Mac McGinnis, WB5LID, 4304 McFarlin Blvd., Dallas, TX. 75205.

UART'S - ANOTHER LOT TMS-6011NC \$11.00 postpaid return mail, with good summary information sheet. Prior purchasers, info sheet for SASE. Peter Bertelli, W6KS 5262 Yost Place, San Diego, CA. 92109. 714-274-7060.

FOR SALE: 19ASR BEAUTIFUL condition. Light gray enamel with black bases refinished and some parts chrome plated, stripped, gutted and rewired for ham use. \$85.00, pick up only. Murray Fisher W7-NSU 1011 Hobson, Walla Walla, Wa. 99362.

11/16 PERFORATOR TAPE. PINK, 14" dia rolls. 2" core, 16 rolls per case. \$5.00 plus shipping. 45 lbs. 3/41.00. Wiedman, K4KOE, 204 Anne Burras, Newport News, Va. 23608.

R-390 VERY GOOD SHAPE \$350; Collins 32S1 clean with 516F2 \$375; Power supplies: TEMPO I 12vdc \$75; S-line homebrew \$40; TTY GEAR: MOD14 reperf, good shape \$30, MOD 28 KSR \$200; TUBES: NEW PL-172 \$80; 4-400A \$25; USED 4-1000A \$30; 4-250A \$17; 4-125A \$12; VacVariable 20-60PF Jennings \$15; DX-40 new, needs debugging \$30. BC-221 w/cal charts book \$25; Johnson Viking Mobile xmt \$30. G.L. HALE K0PIV/4 6334 Edward Street, Norfolk, VA 23513 Phone 804/857-1507.

TELETYPE EQUIPMENT FOR SALE: Model 15s, \$30.00, 14ROTR \$25.00, 14FRXD \$25.00. Model 28 KSR, ASR's, tape equipment, parts, stunt boxes coded. Paul Anderson, 2445 N. Wilson, Royal Oak, MI. 48073

WANTED: MODEL 33 or 35 ASR, will trade R390's, or new model 28RSR. C. F. Burney, 151 Mission, San Francisco, CA. 94105.

M19 AUTO TTY \$125.00, M14 \$25.00, TS383 \$29.00, TMC 2032 mH receiver \$90.00. BC221 LM \$35.00 each. HP100D \$49.00. Motorola 60W 110AC TX-RX supply \$35.00, Motorola 110AC receiver supplies \$9.00, URA-8 modules, Hi-Low band FMTX-RX, TS382 oscillator, RME VHF-152, MV-17VTVM, books, Brown, 45434 N. Fig Ave., Lancaster, CA. 93534.

TECH MANUALS - \$6.50 EACH. TT63A/FGC, CV-591A/URR, TS-2/TG, CV-116, following manuals \$8.50 Each. TT-47/48, R388/URR, FR114/U, USM-50, 51J4; Following \$10.00 each - R390A/URR, BC-11, 12, 13, USM-32, USM-24, URR-35C. Model 14 TD manuals \$2.50 each. Thousands more in stock. Send 50¢ coin - for large list. W3JHD, 7218 Roanne Dr. Washington, DC. 20021.

FOR SALE: FSK CONVERTOR CV89A, excellent condition, checked out w/manual \$90.00 FOB. CV89A manuals \$7.50 PP. Model 28KSR table top, clean \$175.00. HQ170A excellent with manual \$225.00. Federal 57 w/horn \$95.00. Comarator CM22A used with CV89A, good condition \$45.00. Model 28 communications type boxes \$7.50 EA. Presto Microwave secondary freq. standard, 50mhz to 11 GHz, markers spaced 50 mhz, new w/manual \$35.00. Please include funds for shipping, excess cheerfully refunded. Lou Carbaugh, WA30JF, PO Box 398, New Cumberland, Pa. 17070

RTTY PICTURE PERF TAPES. Error-free 11/16" chad type (fully punched, no lids). From 3 minutes to 6 hours in length. Art, portraits, cartoons, audes, animals, holiday themes, etc. Send 16 cents in stamps for catalog and information. NO SASE, please. This is not an illustrated catalog. Joe Dickens, WA9UGE, 601 S. Dodson, Urbana, IL 61801.

KLEINSCHMIDT-TELEPRINTER AN/FGC-25 page printer, reperf, transmitter and table plus technical manual. \$150.00. set for 60 wpm but gears for 100 wpm included. Sorry, am invalided and can not crate or ship. John Isaacs, 3175 Val Verde, Long Beach, CA. 90808. (213) 596-9819.

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